Appendix B
Landscape Design Standards for Stormwater Treatment

1. General Standards

Soil and landscaping play an important role in stormwater impacts and treatment results. From a quantity standpoint, the loss of good quality topsoil from many sites during construction results in significant increases in runoff quantities that are often not calculated in the models such as TR-55 typically used for runoff assessment. In terms of quality, high organic content of soils absorbs and adsorbs many pollutants. In fact peat and compost have been shown to provide considerable pollutant removal and are sometimes used in various treatment strategies.

Landscaping also affects stormwater quality and quantity. Grassed areas, while not totally undesirable, may have considerably more runoff due to compaction and more pollutant contribution due to the frequently-occurring overuse of fertilizers and pesticides. Alternatively, a tiered landscape containing an overstory (typically large shade trees), understory trees, shrubs and groundcovers provides the most absorption and natural uptake of rainfall. Some grass may be included but typically not an expansive monoculture. A more desirable landscape is diverse and provides wildlife habitat, shade, and beauty along with strips of grass for open areas.

Tiered landscapes, like natural landscapes, tend to require less maintenance and chemical input once established. These landscapes, including a highly organic soil profile, absorb and cleanse rainfall and runoff so that the quantity and quality are more reflective of a natural hydrology. By using these specifications, water, pesticide and fertilizer use will be minimized and vegetation will thrive with little but spring and fall cleanup.

2. Soil Preparation

1. Compacted soils restrict root penetration, impede water infiltration, and contain few macropore spaces needed for adequate aeration. In addition, compacted soils have a higher runoff coefficient and should be avoided. Preventing construction activities on parts of the site will help prevent compaction. In areas where this is not practical, methods to compensate for the compaction must be employed. Landscape areas should be deep tilled to a depth of at least 12 inches to facilitate deep water penetration and soil oxygenation. Use of soil amendments is encouraged to improve water drainage, moisture penetration, soil oxygenation, and/or water holding capacity. Soil amendments are organic matter such as compost, sewer biosolids, and forestry by-products, but do not include topsoil or any mix with soil as an element.

2. For all newly landscaped areas, including single-family residences, organic matter (three to four cubic yards of organic matter per 1,000 square feet of landscape area) should be incorporated to a depth of four to six inches. Organic content of landscaped soils shall not be less than 18% by volume in the top six inches of the finished topsoil.

3. For newly landscaped areas where topsoil is limited or nonexistent, or where soil drainage is impeded due to subsurface hardpan or bedrock, 6 to 24 inches of sandy loam topsoil should be spread in all planting and turf areas, in addition to the incorporation of organic matter into the top horizon of the imported soil. Organic content of landscaped soils shall not be less than 18% by volume in the top six inches of the finished topsoil.

4. Soil analysis of new or renovated turf areas should include a determination of soil texture, including percentage of organic matter; an approximated soil infiltration rate; and a measure of pH value.

3. Mulching

Mulch should be applied regularly to, and maintained in all, planting areas to assist soils in retaining moisture, reducing weed growth, and minimizing erosion. Mulches include organic materials such as wood chips, compost and shredded bark and inert organic materials such as decomposed lava rock, cobble, and gravel. If weed barrier mats are used, the use of inert organic mulches is recommended. Non-porous materials, such as plastic sheeting, are not recommended for use in any area of the landscape because of down-slope erosion, potential soil contamination from herbicide washing and increased runoff coefficients. Mulches should be applied to the following depths: three inches over bare soil, and two inches where plant materials will cover. Mulches for stormwater management areas should be heavier and not of a type that will float away.

4. Site Features and Layout

1. Landscaping should be designed to remain functional and attractive during all seasons of the year through a thoughtful selection of deciduous, evergreen, flowering and non-flowering plant varieties.

2. Prominent natural or man-made features of the landscape such as mature trees, surface waters, natural rock outcrops, roadways or stonewalls should be retained and incorporated into the landscape plan where possible. The addition of ornamental rocks, fencing and other features new to the landscape are encouraged.

3. Existing natural vegetation should be retained where possible. Existing trees and shrubs to be retained may be substituted for any compatible required plantings.

4. Lawn areas should be kept to a minimum. Natural re-growth, mulched planting beds and alternative groundcover plant varieties are preferred. Lawn areas should not be planted in strips of less than six feet in width, especially adjacent to roads or parking areas, since such areas require watering but have little utility and are less likely to thrive.

5. Native plant species, or plant species that have been naturalized in the area or the surrounding region should be used to meet the minimum requirements of this section. Plant varieties selected should be hardy, drought and salt resistant, and require minimal maintenance. Less hardy, exotic or higher maintenance plant varieties may be used to supplement minimum landscaping requirements where appropriate, but are not encouraged. Species listed on the current Invasive Species List for Maine shall not be used.

5. Use of Compost

Incorporation of organic matter such as compost improves the structure (tilth) of the till and any other soil types, with the exception of soils that are already highly organic. In sandy soils, compost increases the water holding capacity and nutrient retention. The physical and chemical properties of most New England soils can be significantly improved by blending in compost.

Compost-amended soil has many potential benefits when instituted with establishment of turf and landscaping, including: (1) increased water conservation, (2) increased nutrient retention, (3) better turf aesthetics, (4) reduced need for chemical

use, (5) improved stormwater retention, and (6) cost-savings to the private landowner, and the Town.

Compost shall be a stable, humus-like organic material produced by the biological and biochemical decomposition of source separated compostable materials, separated at the point of generation, that may include, but are not limited to, leaves and yard trimmings, food scraps, food processing residuals, manure and/or other agricultural residuals, forest residues and bark, and soiled or non-recyclable paper. Compost shall not be altered by the addition of materials such as sand, soil or glass. Compost shall contain no substances toxic to plants and shall not contain more than 0.1 percent by dry mass of man-made foreign matter. Compost shall pose no objectionable odor and shall not closely resemble the raw material from which it was derived. Compost shall have a minimum organic matter content of 30 percent dry unit weight basis as determined by loss on ignition in accordance with ASTM D 2974. Compost shall be loose and friable, not dusty, have no visible free water and have a moisture content of 35 - 60 percent in accordance with ASTM D 2974. The particle size of compost shall be 100 percent less than 25 mm in accordance with AASHTO T27 and shall be free of sticks, stones, roots or other objectionable elongated material larger than 50 mm in greatest dimension. The pH of compost shall be in the range of 5.5 - 8.0. The maturity of the compost shall be tested and reported using the Solvita Compost Maturity Test and must score 6 or higher to be acceptable. The soluble salt content of compost shall not exceed 4.0 mmhos/cm as determined by using a dilution of 1 part compost to 1 part distilled water.

The quantity of compost to be incorporated into a site is determined by the final organic content goal for the soil and is dependent on its existing organic content. Organic content of landscaped soils shall not be less than six percent.

6. Low Impact Development Landscaping

Landscaping that incorporates Low Impact Development (LID) strategies for stormwater management should serve to meet the requirements of the Town's stormwater management plan by absorbing and treating stormwater runoff to the greatest extent possible onsite. Low Impact Development landscaping includes the use of biofilters, raingardens, shallow swales, drywells and other features that use soil and landscaping to mimic natural hydrologic features and functions. The high organic content of the soils encourages healthy growth and absorbs and retains rainwater on site as soil moisture, minimizing irrigation needs and runoff quantities.

Landscape areas shall include all areas on the site that are not covered by buildings, structures, paving or impervious surface. The selection and location of turf, trees, ground cover (including shrubs, grasses, perennials, flowerbeds and slope retention), pedestrian paving and other landscaping elements shall be used to absorb rainfall, prevent erosion and meet the functional and visual purposes such as defining spaces, accommodating and directing circulation patterns, managing hardscape impacts, attracting attention to building entrances and other focal points, and visually integrating buildings with the landscape area. Where possible, the landscaping design should combine form and function, incorporating drainage features invisibly into the landscape such as through shallow detention areas, parking lot islands that provide for infiltration of parking lot runoff and sheet flow.

7. Neighboring Properties

Landscape Design Plans shall mitigate the impact to neighboring properties. The rear elevations of buildings, loading docks, and refuse collection areas must also be addressed in the Landscape Design Plan. It is required that rear elevations adjacent to non-commercial zoned parcels will be screened to the full height of the structure within seven (7) years of occupancy of the retail space.

8. Parking Lots

Parking lots with more than fifty (50) parking spaces shall have curbed planting areas. Planting areas shall be placed at each end of a parking row. No parking row shall contain 30 contiguous parking spaces without a curbed planting area.

Curbs around parking lot planting areas shall have a shallow descending cut that is a minimum of five feet wide to allow drainage to flow from the parking lot into the curbed planting areas for infiltration. Such planting areas shall be underlain by a suitable layer of crushed stone or other water holding reservoir, with an overlay of filter fabric to minimize clogging by fines. Topsoil depths and minimum organic content shall be as above for other landscaped areas for the maximum absorption of rainfall.

9. Vegetation

Any landscape element that dies, or is otherwise removed, shall be promptly replaced with the same, if not similar to, height or texture element as originally intended.

A split rail or picket fence, not less than two feet in height and not more than four feet in height, shall be provided between or to the rear of the trees to serve as a back drop and support for the shrubs and other planting, to serve as a unifying architectural element, and to protect against damage cause by pedestrian "cut-through" traffic. Shrubs and other smaller plantings should be placed between the fence and the street or on both sides where the fence is placed toward the center of the landscaped strip.

Landscape strips should be mulched or planted with hardy groundcover plant varieties rather than planted as lawn areas. Where landscape strips are used as part of the drainage system, plantings shall be tolerant of periodic wet conditions and shall be shallowly sloped to allow infiltration and storage.

Wheel stops should be provided in all parking areas abutting landscaped strips to avoid accidental damage.

Collector Roads: A deciduous shade tree and accompanying understory shrubs and groundcovers shall be planted in groupings along the front property line of all sites adjoining the collector road at a rate of not less than 1 tree per 25 linear feet of property frontage. Where larger shade trees may interfere with overhead utilities, minor shade or ornamental tree varieties should be used.

10. Maintenance

Low maintenance, drought, insect and disease resistant plant varieties are encouraged so that buffer areas and other required landscaping can be maintained with minimal care and the need for watering, pesticide or fertilized use is minimized. For these reasons, native species and species that have long thrived within the region are preferred since such plant species are well adapted to the local environment.

To avoid maintenance problems, soil testing should be conducted prior to planting to ensure that the appropriate plant varieties are selected for various portions of a site.

To avoid maintenance problems and excessive watering, organic matter such as compost or peat should be added to the soil before planting as appropriate to increase the water holding capacity of the soil and to provide nutrients.

Where used, irrigation systems should be installed with moisture meters or other devices designed to avoid unnecessary or excessive watering. Alternatively, irrigation systems should be manually activated.

11. Informal, Re-growth and Peripheral Landscape Areas

Disturbed areas intended for natural re-growth should be, at a minimum, graded, loamed and seeded with wildflowers, perennial rye grass or similar varieties. The planting of native trees, shrubs and other plant varieties is encouraged. The planting of blueberry, rhododendron, winterberry, bayberry, shrub dogwoods, cranberry bush, spicebush, native viburnums and other hardy shrubs along the edge of cleared woodlands provides for an attractive transition between natural woodland and more formally landscaped portions of a site. Where woodland areas are intended to serve as buffers, such plantings can fill in voids by rapidly reestablishing undergrowth. Perennial flowerbeds are also encouraged.

Plant Specifications and Definitions

1. Trees and shrubs - installation size requirements
   a) Minimum size for shade or canopy trees shall be 3 inches in diameter measured at a point six inches above grade with a height of not less than 12 feet.
   b) Minimum size for small or minor shade trees shall be 2.5 inches in diameter measured at a point six inches above grade with a height of not less than nine feet.
   c) Minimum size for ornamental or flowering fruit trees shall be 2 inches in diameter measured at a point six inches above grade with a height of not less than seven feet.
   d) Minimum size for evergreen trees shall be six feet in height.
   e) Minimum size for shrubs shall be 1.5 feet in height.

2. Planting Specifications
   a) Areas intended as planting beds for shrubs or hedges shall be cultivated to a depth of not less than 18 inches. All other planting beds shall be cultivated to a depth of not less than 12 inches.
   b) Pits for planting trees or shrubs shall be generally circular in outline with vertical sides. Pits for trees or shrubs shall be deep enough to allow one-eighth of the ball of the roots to be the existing grade. Pits for trees shall be wide enough to allow for at least 9 inches between the ball of the tree and the sides of the pit on all sides.
   c) Cultivated areas shall be covered with not less than a two to three inch deep layer of mulch after planting.
   d) All trees and shrubs shall be appropriately pruned after planting with all broken or damaged branches removed.
   e) All plants shall be nursery grown.

3. Retention of Existing Vegetation
   The boundary of areas to be cleared should be well defined in the field with tree markings, construction fencing or silt fencing as appropriate to avoid unnecessary cutting or removal. Care should be taken to protect root systems from damage from excavation or compaction. Individual trees, rock formations and other landscape features to be retained should also be clearly marked and bounded in the field.

12. Recommended Plant Varieties

See Attachment A

13. Definitions

1. Berm: a linear earthen mound designed to block views, noise or other potentially objectionable circumstances.
2. Deciduous: a plant with foliage that is shed annually.
3. Evergreen: a plant with foliage that is retained and remains green throughout the year.
4. Mulch:nonliving organic or synthetic matter spread over cultivated ground to retain moisture, limit weed growth and control erosion.
5. Ornamental tree: a deciduous tree, generally smaller than a shade tree, that is planted primarily for its aesthetic or ornamental value.
6. Shade tree: a large deciduous tree with a high crown of foliage or overhead canopy.
7. Shrub: A self-supporting woody plant, smaller than a tree, which consists of several small stems or branches from a base at or about the ground.

Attachment A

Suitable Raingarden Plant Species

Latin Name		Common Name
Acorus	*calamus*	Sweet flag
Adiantum	*pedatum*	Maidenhair fern
Agastache	*foeniculum*	Giant hyssop
Amelanchier	*canadensis*	Shadblow serviceberry
Amelanchier	*laevis*	Allegheny serviceberry
Andropogon	*gerardii*	Big bluestem
Anemone	*canadensis*	Canada anemone
Angelica	*atropurpurea*	Angelica
Apocynum	*androsaemifolium*	Dogbane
Aquilegia	*canadensis*	Columbine
Arisaema	*triphyllum*	Jack-in-the-pulpit
Aronia	*arbutifolia*	Red chokeberry
Aronia	*melanocarpa*	Black chokeberry
Asclepias	*incarnata*	Swamp/Marsh milkweed
Asclepias	*syriaca*	Common milkweed
Asclepias	*tuberosa*	Butterfly weed
Aster	*novae-angliae*	New England Aster
Athyrium	*filix-femina*	Lady fern
Betula	*nigra*	River birch
Calamagrostis	*canadensis*	Blue joint grass
Caltha	*palustris*	Marsh marigold
Campanula	*rotundifolia*	Harebell
Carex	*comosa*	Bottlebrush sedge
Carex	*crinita*	Caterpiller sedge
Carex	*interior*	Prairie star sedge
Carex	*lurida*	Lurid sedge
Carex	*pendula*	Drooping sedge
Carex	*scoparia*	Broom sedge
Carex	*stipata*	Common fox sedge
Carex	*vulpinoidea*	Brown fox sedge
Cephalanthus	*occidentalis*	Buttonbush
Chelone	*glabra*	Turtlehead
Clematis	*virginana*	Virgin's bower
Clethra	*alnifolia*	Sweet pepperbush
Cornus	*amomum*	Silky dogwood
Cornus	*racemosa*	Gray dogwood
Cornus	*sericea*	Red osier dogwood
Corylus	*american*	American hazelnut
Desmodium	*canadense*	Showy tick-trefoil
Dicentra	*eximia*	Fringed bleeding heart
Diervilla	*lonicera*	Low bush honeysuckle
Echinacea	*purpurea 'Nanna'*	Purple coneflower
Eleocharis	*palustris*	Great spike rush
Elymus	*virginicus*	Virginia wild rye
Equisetum	*fluviaile*	Horsetail
Eupatorium	*maculatum*	Joe-pye weed
Eupatorium	*perfoliatum*	Boneset
Eupatorium	*purpureum*	Savanna joe-pye weed
Filipendula	*rubra*	Queen of the prairie
Fothergilla	*gardenii*	Fothergilla
Fragaria	*virginiana*	Wild strawberry
Galium	*boreale*	Northern bedstraw
Gentiana	*andrewsii*	Bottle gentian
Geum	*triflorum*	Prairie smoke
Glyceria	*striata*	Fowl manna grass
Hamamelis	*virginiana*	Witch hazel
Helenium	*autumnale*	Sneezeweed
Helianthus	*laetiflorus*	Showy sunflower
Helianthus	*mollis*	Downy sunflower
Helianthus	*occidentalis*	Ox-eye sunflower
Hypericum	*pyramidatum*	Great St. John's wort

Suitable Raingarden Plant Species

Hypericum	*virginicum*	Marsh St. John's wort
Hystrix	*patula*	Bottlebrush grass
Itea	*virginica*	Virginia sweetspire
Ilex	*glabra*	Compact inkberry holly
Ilex	*verticilatta*	Winterberry
Iris	*versicolor*	Blue flag iris
Juncus	*effusus*	Common/soft rush
Juncus	*torreyi*	Torrey's rush
Lespedeza	*capitata*	Roundhead bush clover
Liatris	*scariosa*	Northern blazing star
Liatris	*ligulistylis*	Meadow blazing star
Liatris	*spicata*	Marsh blazing star
Lindera	*benzoin*	Common Spicebush
Lobelia	*cardinalis*	Cardinal flower
Lobelia	*siphilitica*	Blue lobelia
Matteuccia	*struthiopteris*	Ostrich Fern
Mertensia	*virginica*	Virginia Bluebells
Mimulus	*ringens*	Monkey flower
Monarda	*didyma*	Beebalm
Monarda	*fistulosa*	Wild bergamot
Onoclea	*sensibilis*	Sensitive fern
Osmunda	*cinnamomea*	Cinnamon fern
Osmunda	*regalis*	Royal fern
Panicum	*virgatum*	Switchgrass
Penstemon	*digitalis*	Smooth penstemon
Phlox	*divaricata*	Wild blue phlox
Phlox	*glaberrima*	Marsh phlox/smooth phlox
Phlox	*maculata*	Wild sweet William
Phlox	*pilosa*	Prairie phlox
Polygonatum	*falcatum*	Dwarf Solomon's seal
Pteridium	*aquilinum*	Bracken fern
Pycnanthemum	*virginianum*	Mountain mint
Quercus	*rubra*	Red oak
Ratibida	*pinnata*	Yellow coneflower
Rhododendron	*catawbiense*	Mountain rosebud rhododendron
Rhododendron	*maximum*	Rosebay rhododendron
Rudbeckia	*hirta*	Black-eyed Susan
Rudbeckia	*subtomentosa*	Brown-eyed Susan
Ruellia	*humilis*	Wild petunia
Salix	*caprea*	Pussy willow
Salix	*purpurea 'Nanna'*	Blue arctic willow
Sambucus	*canadensis*	Common elderberry
Schizachyrium	*scoparium*	Little bluestem
Scirpus	*atrovirens*	Dark green bulrush
Scirpus	*cyperinus*	Woolgrass
Scirpus	*fluviatilis*	River bulrush
Scirpus	*validus*	Softstem bulrush
Scutterlaria	*lateriflora*	Mad-dog skullcap
Solidago	*riddellii*	Riddell's goldenrod
Solidago	*rigida*	Stiff goldenrod
Solidago	*sempervirens*	Goldenrod
Spartina	*pectinata*	Prairie cord grass
Spiraea	*alba*	Meadow sweet
Spiraea	*tomentosa*	Steeplebush
Thalictrum	*dasycarpum*	Tall meadow rue
Tiarella	*cordifolia*	Foamflower
Vaccinium	*sp.*	Blueberry
Vernonia	*fasciculata*	Iron weed
Veronicastrum	*virginicum*	Culver's root
Viburnum	*dentatum*	Arrowwood viburnum
Zizia	*aurea*	Golden Alexander